DOCUMENT RESUME

ED 198 073 SP 016 109

AUTHOR Creswell, John L.: Houston, Gustie M.
TITLE Sex Related Differences in Mathematics Achievement of Black, Chicano and Anglo Adolescents.
PUB DATE [80]
NOTE 7p.

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Academic Achievement: Adolescents: Black Students: *Ethnic Groups: *Mathematics Instruction: Mexican Americans: *Parent Influence: *Peer Influence: Secondary Education: Sex Differences: *Social Influences: Student Attitudes: White Students
IDENTIFIERS *Mathematics Achievement

ABSTRACT

This study explored mathematics achievement differences among and between black, anglo, and chicano male and female adolescents and the extent to which these differences are associated with differences in attitude toward mathematics, parent influence, peer influence, and societal influence. Subjects were secondary students in a large school district in the Houston, Texas metropolitan area whose clientele is composed of substantial numbers of these three ethnic groups. Participants were chosen from the eighth and eleventh grades. Each of the eighth grade subjects was administered the Iowa Test of Basic Skills in mathematics, while each eleventh grade subject was administered the Stanford Test of Academic Skills in mathematics. Additionally, each subject was administered the Aiken and Dreger Revised Math Attitude Scale along with the Fennema-Sherman Scales, e.g. mother/father influence, math as a male domain, and mathematics usefulness. Most of the findings support those of similar studies. However, Fennema and Sherman found father influence significant and, in this study, mother influence was found significant while father influence was not. Sex was found to be a nonsignificant variable. Race was found a significant contributor to variance in mathematics achievement. (JD)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED198073

Sex Related Differences in Mathematics Achievement of Black, Chicano and Anglo Adolescents

John L. Creswell

University of Houston

Gustie M. Houston

Houston Independent School District

U S DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

John L. Creswell

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

Running head: Sex Related Differences in Mathematics

SP 016 109

Sex Related Differences in Mathematics Achievement of Black, Chicano and Anglo Adolescents

Objective

The objective was to explore mathematics achievement differences among and between black, anglo and chicano male and female adolescents and the extent to which these differences are associated with differences in attitude toward mathematics, parental influence, peer influence, and societal influence.

Perspectives

Most related literature indicates sex related differences in the study of mathematics, and in selection of occupations requiring mathematics; these differences almost always favor the male, (Aiken, 1976, 1972; Burton, 1979, Fennema, 1974). However, virtually all of the literature has been gathered from a population that is not representative of the influences on the population of adolescents, e.g., with one exception, all studies have involved white, middle class subjects, (Ernest, 1976; Kagan, 1972; Fox, 1976). Only one study related to blacks, and none related to chicanos, (Schratz, 1976). The present study, therefore, set a precedent in that it involved black, anglo, and chicano adolescents from all socio-ecomonic levels.

Methods (Procedures) and Data Source

The study was conducted in a large school district in the Houston, Texas metropolitan area whose clientele is composed of substantial numbers of three ethnic groups, i.e., black, anglo, chicano.

A sample of twenty-five subjects were randomly selected from each of the following groups: eighth grade black, anglo and chicano males; eighth grade black, anglo and chicano females; eleventh grade black, anglo and chicano males; and eleventh grade black, anglo and chicano females; for a total of 300.

Each of the eighth grade subjects was administered the Iowa Test of Basic Skills in mathematics, while each eleventh grade subject was administered the Stanford Test of Academic Skills in mathematics. Raw scores were used in the analysis.

Additionally, each subject was administered the Aiken and Dreger Revised Math Attitude Scale along with the Fennema-Sherman Scales, e.g., Mother/Father Influence, Math As A Male Domain and Mathematics Usefulness.

The linear multiple regression model using techniques of Kerlinger and Pedhazur as outlined in Multiple Regression in Behavorial Research was used to test the hypotheses.

Consequently, a set of research questions were posed, and corresponding hypotheses generated. To clarify the mathematical statements to be made, the control variable, grade, is denoted by c, the categorical variables of sex and ethnicity denoted as a set by f, the predictor variables of Mother Influence, Father Influence, Male Domain, Usefulness, and Attitude denoted as a set by p, and the interaction terms of predictor variables X categorical variables as a set by i. The dependent variable of achievement is denoted by y. Using multiple regressions to calculate R^2's in this manner and using the F test to evaluate the statistical significance of increments to predict is a powerful method of analysis.

Findings

Question 1. Is the proportion of variance in achievement accounted for by the full model statistically significant and/or meaningful? The corresponding research hypothesis and associated F ratio test is:

$$H_0L: \; R^2_{y.cfpi} - R^2_{y.c} = 0; \quad F = \frac{(R^2_{y.cfpi} - R^2_{y.c})/\,(24 - 1)}{1 - R^2_{y.cfpi})/\;(300 - 24 - 1)}$$

This question was asked for completeness, since it was assumed from the literature review and design of the research problem that the variables would explain a significant amount of variance.

Analysis indicated that approximately 38% of the variance was accounted for by the full equation and the F value indicated a significance at the .01 level. The hypothesis was not accepted.

Question 2. Is there a significant interaction between the predictor variables and the categorical variables?

$$H_o2: \; R^2_{y.cfpi} - R^2_{y.cfp} = 0; F = \frac{(R^2_{y.cfpi} - R^2_{y.cfp}) \; / \; (24 - 9)}{(1 - R^2_{y.cfpi}) \; / \; (300 - 21 - 1)}$$

Analysis indicated that approximately 6% of the variance was accounted for by the interaction, and the F value produced a significance at the .05 level. The hypothesis was not accepted.

Since H_o2 was found to be significant, the following separate equations were calculated:

$H_o3: \; R^2_{y.cfpi_{sex}} - R^2_{y.cfp} = 0$ and $H_o4: \; R^2_{y.cfp_{race}} = 0$; e.g., were the categorical variables significantly different from each other? In analyzing H_o3 and H_o4 it was found that sex and an insignificant contributor to the variance (approximately 1%) while race contributed approximately 5% of the variance with a significance at the .01 level.

Given the analysis of H_o3, it was appropriate to ascertain the contribution of the predictor variables beyond that accounted for by the categorical variable, e.g.,

$$H_o5: \; R^2_{y.cfp} - R^2_{y.cf} = 0.$$

The analysis of H_o5 revealed that the five predictor variables together contributed approximately 18% of the variance, ($p < .01$). However, of the five, only Male Domain and Mother Influence contributed significantly ($p < .01$).

Discussion

Most of the findings of this study support the findings of similar studies, although in studies by Fennema and Sherman, Father Influence was a significant contributor, whereas in the present study Mother Influence was significant while Father Influence was not. Surprisingly, sex was found to be a non-significant variable.

The finding that race was a significant contributor to variance in mathematics achievement cannot be compared to previous studies, since no such studies have been reported. It is felt, however, that the findings regarding race as a significant contributor, sets a precedent in studies of this nature.

References

Aiken, Lewis R. Jr. Update on attitudes and other affective variables in learning mathematics. Review of Educational Research, 1976, 46 (2), 293 - 311.

Burton, Grace M. Regardless of sex. The Mathematics Teacher, 1976, 72 (4), 261 - 270.

Ernest, J. Mathematics and sex. Santa Barbara: University of California, April 1976, 30pp.

Fennema, Elizabeth. Sex differences in mathematical achievement. Journal of Research in Mathematics Education, 1974, 5, 126 - 139.

Fox, Lynnx H. Women and career relevance of mathematics and science. School Science and Mathematics, 1976, 26 (4), 347 - 353.

Kagan, J. The emergence of sex differences, School Review, 1972, 80, 217 -229.

Schratz, M. M. A development investigation of sex differences, perceptual differentiations, and mathematics reasoning in two ethnic groups. (Doctoral dissertation, Fordham University, 1976). Dissertation Abstracts International, 1976, 37, 962b. (University Microfilm no. 76 - 17, 943.)